

CHAMBERS'S JOURNAL

OF

POPULAR

LITERATURE, SCIENCE, AND ART

Fifth Series

ESTABLISHED BY WILLIAM AND ROBERT CHAMBERS, 1832

No. 603.—VOL. XII.

SATURDAY, JULY 20, 1895.

PRICE 1½d.

THE GENTLE ART OF BOOKBINDING.

By VIOLET CHAMBERS TWEEDALE.

IN tracing the history of this beautiful and artistic craft, the inquirer finds himself on the distant shores of that far-back time when books were first made. From the birth of literature, he must follow his subject through the various stages of progress leading to that great triumph of human intelligence, a noble book nobly bound—from first beginnings, when the savage loosely wrapped up his picture writings in leaves or skins, to the glorious workmanship of the sixteenth century, and onward still to the mechanically perfect execution of the present day.

Before the invention of printing, the work of binding books was mostly confined to the goldsmith and those monkish bibliophiles who, having laboriously written and carefully illuminated a manuscript, sought to prepare a worthy cover in which to preserve their treasure. Many of the works prior to the fifteenth century which have been handed down to us are of a devotional character, gorgeous in velvet, studded with jewels, with bosses of gold and silver, and rich in ornamentation of every kind. But bookbinding as we know it may be said to have come into vogue with the Mainz Bibles and the Aldine editions of the classics. Without doubt Italy of the sixteenth century was the home and headquarters of artistic bookbinding. On the borders of the Adriatic, Aldo Manuzio first set up his press, and seeking to make the binding rival the beauty of the type, brought the science of boarding as near perfection as it is possible to attain. Even to-day, what a thrill goes through the book-lover as he fingers some Aldine edition, with its beautiful Greek or Roman type, and the sign of the well-known anchor and dolphin!

Those early pioneers had the advantage of being assisted by artists of no mean merit, who did not scorn to use their decorative faculty

in the outward adornment of works not always worthy of their coverings. Many noble patrons arose in support of this illustrious house. Isabella d'Este, Marchioness of Mantua, patronised largely Manuzio's establishment; and the old Aldo is said to have printed her books on vellum, and decorated the boards in the most sumptuous manner. This celebrated house flourished for about a hundred years, son succeeding father; and during that period nine hundred and eight different works were given to the world by their presses.

The old stamped blind-work—impressed marking on the boards without gilding or colour—which characterised the earlier period now gave place to decoration by means of tooled markings in fret. The designs were often purely Oriental. No doubt Aldo employed Greek and Oriental workers, who brought with them their art traditions, and probably much of his work was copied from Eastern manuscripts. One folio in the British Museum is bound in brown calf, bearing a circular ornament in the centre panel, and the text, 'The kingdom is God's,' set forth in Arabic characters. The design, which is outlined in gold, is produced by a matting of gold with a small point. Broad lines encircle the panel, and an interlaced cable pattern, partly in gold, partly in blind-work, completes the decoration. The leather commonly used in the Aldine workshop was a smooth olive-coloured skin. Aldo was the first to discard wooden boards.

Italy did not maintain her supremacy in binding, and the art there seems to have decayed rapidly towards the close of the sixteenth century. Perhaps the skill of Italian binders is nowhere better exemplified than in the works handed down from Tommaso Maioli's library. All his books were the perfection of binding, and had on the outside the inscription, 'Tho. Maioli et Amicorum,' usually placed upon a scroll below the shield which bore the title of the book. There are several specimens of Maioli's work in the British Museum, one of

which is bound in rich yellow morocco. The delicate gold tooling round the border is composed of butterflies, daisies, and myrtle twigs. Some of his bindings were in black morocco, decorated with gold scroll-work, and with a mosaic of red and white leather. Many of Maioli's books passed eventually to Paris. The perfection of the scroll-work, the graceful curves, the moresque ornaments, are characteristic of the library of this famous collector. One beautiful effect in some of them was arrived at by rubbing gold-leaf into the leather, thereby imparting a peculiar and rich bloom to the boards.

France began to produce beautiful bindings under the directorship of Jean Grolier de Servin, a courtier and diplomat, born in 1479, who lived long in Italy, and had his bindings largely done by Italian workmen. No literary treasure beloved of the bibliophile is more highly prized than an example of Grolier's library. He possessed about three thousand books, many of which were magnificently bound in brown calf, highly ornamented with floral arabesques, and the geometrical patterns with which his name is associated. There must have existed some close intimacy betwixt Aldo and Grolier. Many books issued from the Aldine press were dedicated to Grolier, and *éditions de luxe* were presented to his library. Grolier was the first to use morocco dressed as now, getting his supplies direct from the Levant; and he was amongst the first to use lettering pieces for the backs of his books.

During the whole of the sixteenth century the printer or publisher was the binder, and only in the seventeenth century do we find the work of binding done outside by master-binders. Grolier searched Italy for skilled workmen, both printers and binders, though he probably prepared many of the designs. The mottoes stamped on his books varied at different periods of his life. But the one which seems to have been most frequently used was 'Io. Grolierii et Amicorum,' proving that, like Maioli, the fastidious Grolier was also desirous of sharing his treasures with those worthy the name of friend.

In England, as early as the twelfth century, Durham, London, and Winchester, with several celebrated monasteries, had each its school of binding. Durham still possesses a series of books, bound towards the close of the twelfth century, that are well worthy to compete in excellence and beauty with the work of foreign nations. Oxford and Cambridge both produced an interesting series of bindings, prized by connoisseurs. Lady Fitzhugh, bequeathing her books to her family, wrote thus in her will in 1427: 'I wyl that my son Rob't have a Sautre covered with rede velvet; and my doghter Marion a Primer cou'ed in rede; and my doghter Darcy a Sauter cou'ed in blew; and my doghter Mal-de-Eure a Prim cou'ed in blew.'

The introduction of printing into England, when Caxton set up his press in Westminster, changed the character of the bindings, owing, no doubt, to the influx of foreign workmen. Caxton's bindings were as a rule very simple, always of leather, with stamps of flowers

and curious animals. Several bindings produced by John Reynes, now in the possession of the British Museum, show to what excellence the art had attained during the reign of Henry VIII. Grolier's patterns were introduced into England during the reign of Edward VI. It was then that gold tooling became usual in England, the majority of Henry VIII's books being blind-tooled. The books belonging to Edward VI. which are treasured in the British Museum are well worthy of notice. Perhaps the finest is *Petri Bembi Cardinalis Historia Veneta, Venetiis, 1551*. Each cover is adorned with the king's arms and crowned initials. Above the arms stands the royal motto, 'Dieu et mon Droyt.' The interlaced pattern is in black. Another book has the motto 'Omnis Potestas a Deo' on the sides. The royal arms are on the edges of the leaves, and painted in colours, with gold initials.

The bindings done for Queen Elizabeth were exceptionally fine; the embroidered covers, decorated with silver, precious stones, and enamel, testify to her sumptuous tastes. On her visit to Cambridge in 1578, she was presented with a Greek Testament, 'bound in redd velvet, and lyned with gold, the armes of England sett upon eche side of the booke, vearay faire.'

Mary, Queen of Scots, also showed considerable interest in the adornment of her library, which changed its character according to her eventful life, the works bound for her towards the close of her reign being in funereal black, suggestive of the fate that hung over her head. In the British Museum there is an old Testament, once the property of the unhappy Queen, which is bound in truly regal style. The thick boards are covered with crimson velvet, richly embroidered with gold twist and coloured flowers. Brass bosses and clasps, engraven with the arms of England, go to make up a truly royal volume.

The introduction of the style known as *fanfare* became general at the end of the sixteenth and beginning of the seventeenth centuries. It was first introduced by Nicolas and Clovis Eve, a family of binders who worked for Henri III. In 1579 Nicolas bound forty-two copies of the *Livre des Statuts de l'Ordre du Saint Esprit* for the king; and Clovis bound for Henri IV. and Louis XIII. The Eves produced three distinct styles of work. In one, the *azured* toolings of Lyons were used with rich interlacings and spirals. In the last, the spirals have become smaller, palms and oak branches mingling in the decorations. In their earlier work the compartments are not filled in. Toolings seem to have attained to the height of delicacy about 1625, when Le Gaston improved on the *fanfare* of the Eves. His designs of minute arabesque, on scarlet morocco, are notably beautiful. His habit of forming a pattern of innumerable gold dots caused his style to be known as *pointillé*.

Some very fine binding was executed for King James I., who during his entire life was an enthusiastic patron of letters and art. In some of his books the thistle is introduced with heavy corner-pieces, and the arms in the centre. One fine piece of work, now in

the British Museum, is in bright brown calf powdered with *fleurs de lys*. Another folio in crimson velvet has the arms of England embroidered on both sides, with gold thread on a groundwork of yellow silk. The king's initials are worked above. The lettering is in leather, and the boards are tied together by red ribbon, constituting a regal book in every particular. John Gibson in Scotland, and the Barkers in England, were appointed to be the king's binders; but there is little trace of their work now extant.

The beginning of the eighteenth century seems to have marked the gradual dying out of royal interest in bookbinding. The buying of books extended enormously, but the binding was executed for the people, not the king. Suddenly, out of that dark dawn began a new and brilliant era, when English binders made efforts that soon gave them a foremost place. Trade revived, and early bindings lying *perdu* in the charter rooms of old houses were eagerly sought out and reproduced. Book-collecting became the hobby of many noble Houses, and the demand was productive of the most satisfactory results. About 1720 the firm of Eliot and Chapman produced the *Harleian* style in their work for the library of the first Earl of Oxford (Robert Harley). Those books are all solidly bound, their decoration consisting of centre panels, combining the pine-apple with a broad tooled border. The leather used was red, and the centre ornament usually diamond in form.

Russia leather came into use for book covers about the year 1730; and the middle of the eighteenth century witnessed the introduction of the *swan back*, the bands with which the book was sewn being concealed behind the sheets, no projection appearing. Russia leather was largely used by Roger Payne, who seems to have been the first binder who attempted to attune the outside adornment to the internal contents of his books. He performed every part of the work with his own hands. His designs are very graceful, and consist of stars, crescents, trellis-work of vines, &c. The colour he mostly affected was what he termed *Venetian*, namely, olive green. His great taste in ornamentation brought him many patrons amongst the rich and noble. Bindings by Payne are easily recognised by their marked characteristics, one of which is a peculiar method of arranging bands. There is no doubt that the entire race of English binders owe much to Payne's workmanship, both on account of its purity of design and high finish.

The nineteenth century thus saw the revival of all that was elegant and good in ancient boarding. John Whittaker was the first to introduce a style called the *Etruscan*, in which the designs are carried out in their own colours in place of gilt. The British Museum possesses the Prayer-book of Queen Charlotte, elaborately bound by one Edwards of Halifax, in Yorkshire. This binder successfully pursued the Etruscan style, and took out a patent in 1785 for his own peculiar method of ornamentation, the chief feature of which was painting on vellum. The royal Prayer-book, a beautiful example of his work, is elaborately coloured and gilded.

Case-binding, or 'cloth-work,' was first introduced into England by Pickering the publisher and his bookbinder Leighton in 1825. It took the place of the paper formerly in vogue, and the first cloth covers had printed labels in place of lettering. The first book issued in stamped cloth covers was an edition of the *Penny Cyclopædia* which came from the workshop of Archibald Leighton.

To what higher realms of fancy and art the gentle craft of bookbinding may yet attain, it would be hazardous to guess. Elaborately decorated children's books are one of the features of the age. The outward attractiveness of the gift makes the book of tenfold interest in the youthful recipient's eyes, and may often induce the love of collecting in early years, thus helping to lay the foundations for a happy old age, for no life can be said to be lived to the full without the eloquent silence of well-filled book-shelves. It is matter of regret to the lover of beautiful bindings that originality of design seems for the time being to have fallen into abeyance. Though the bindings of old are well worthy of imitation, yet the lovers of the bibliopægistic art long for a new stimulus to be given to their favourite hobby. The hydraulic press, the rolling-machine, the embossing and arming press, have done much for the art of boarding. At no time has our present style of finish, solidity, and elasticity been surpassed. The newest methods may doubtless be said to have grown out of the old ones, as

Out of old fields
Cometh all new corns fro yere to yere,
And out of old bookes, in good faith,
Cometh all this new science that men lere.

Let us hope the modern sons of this ancient craft, who have so skilfully adapted the old to the new, will not rest content till they are not a hair's-breadth behind their predecessors in technical skill or grace of design; future effort and artistic aspiration will doubtless lead the craft to new triumphs.

AN ELECTRIC SPARK.*

CHAPTER XII.—TOO LATE! TOO LATE!

'MR DALTON back?' said Wynyan in surprise. 'Yes, sir,' replied old Hamber, shaking his head; 'and I'm afraid he had better have stopped away. Mr Brant has just left him, and they have been having words.'

'Quarrelling?'

'Yes, sir; you could just hear something through the baize door. It's very, very sad.'

'Yes, sad indeed. How long has he been here?'

'Best part of half an hour, sir. He came in a cab, and said he had not long been up from Brighton. Looked a deal better, sir—more like he used, sir; but I'm afraid he won't be so well now.'

Wynyan went to the baize door, opened it, and passed through; then tapped at the inner

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door, but there was no reply. He waited a minute, and tapped again. Still no answer; and after hesitating a few moments, he knocked sharply, turned the handle, and entered.

'Nobody here,' he muttered; and he was in the act of crossing to the farther room, when he caught sight of Dalton lying with outstretched arms, face downward, upon the thick Turkey carpet beyond the table.

At the first glance, Wynyan saw that the old man was clutching a familiar packet in his left hand; and catching it from him, he thrust it into his pocket, feeling that it was a duty to preserve that from falling into other hands. The next moment, he had turned the sick man over, and saw that his eyes were wide open and seemed to question him.

'The paper, the plans?' said Wynyan hastily. 'Yes, sir: here: safe.'

He half drew them from his breast-pocket, and thrust them back to grasp the old man, as Dalton slowly closed his eyes.

Wynyan's next act was to open the table drawer where the drops were always kept; but the bottle had not been there for days; and grasping the imminence of the danger, he rushed out.

'Mr Hamber, here! Mr Dalton has fainted. Quick, one of you, a cab. Fetch Doctor Kilpatrick.'

One of the clerks rushed off as Hamber and Wynyan hurried back into the room, where everything possible was done.

'Do you think we had better get him back home, sir?' said Hamber nervously. 'He doesn't seem to come to a bit!'

'I dare not risk it,' replied Wynyan. 'We must wait until the doctor comes.—Keep on fanning him while I bathe his temples.'

But the minutes went by till half an hour had glided away, and still there was no change.

'Mr Brant Dalton ought to be here,' said Wynyan sternly. 'Do you know where he has gone?'

'No, sir,' said the old man piteously. 'He went out as you came in.'

'Send some one in a cab to his chambers to tell him of his uncle's seizure. He may be there.'

The old man went out; and Wynyan knelt down by the insensible man again, a cold, chilly feeling of despair creeping over him, and sending his thoughts away to the pleasant home where there was one in profound ignorance of her father's state. And now the thought came, ought he to rush off and tell her, bringing her back?

No: his place was by the old man's side, and it would be a cruelty to perhaps give the poor girl unnecessary alarm. For, though this fit was strangely prolonged, it might be similar in nature to others from which Dalton had suffered.

Then Hamber came back.

'I have sent some one, sir,' he said.

'Do you think we ought to send a messenger to South Audley Street?' whispered Wynyan.

'For Heaven's sake, no, sir! It would frighten the poor dear young lady terribly. I hope he will come to soon; and he would not, I am sure, like for us to have sent.'

'No,' said Wynyan thoughtfully. 'But I am getting terribly alarmed.'

'Shall I send for the nearest doctor, sir?'

'I would have said so before; but a stranger would not grasp the peculiarities of his constitution, and we could not readily explain matters. Better wait a little longer.'

They waited for another quarter of an hour, when, alarmed more and more by the terrible pallor, Wynyan rose from where he had knelt bathing the wrinkled forehead, and hurried through to the office, where all the clerks were now collected.

'Two of you,' he said, 'fetch the nearest doctor. Go different ways.'

At that moment a carriage stopped at the door, and Wynyan ran out on to the landing to find Dr Kilpatrick coming up the stairs, followed by the clerk who had been for him.

'How is he?' was the stern question. 'I thought he was at Brighton.'

The next minute he was upon his knees by his old patient, and for the next hour applied remedy after remedy without effect, while Wynyan and Hamber stood watching and attending upon the skilful physician as he kept on making demands.

At about that time the door was opened behind them. 'Go away!' said the doctor sharply. 'Don't interrupt.'

'But my uncle—how is he?' said a familiar voice; and Wynyan looked round to see that Brant was coming forward, looking ghastly. 'Baines came to fetch me.'

'Oh, it's you,' said the doctor quietly. 'There; I can do no more. My carriage is waiting; we must get him home at once.—Mr Wynyan, will you come with me? No; stop; it ought to be your duty, Brant. Will you two young men carry him down in a chair, or will you have help?'

'We can do it,' said Wynyan, Brant remaining speechless.

'Quick, then.—Take that light cane-seat chair; I'll follow behind and hold him back.'

The limp figure was lifted into the chair, and Dalton's head hung over upon his left shoulder. Hamber hurried on first to descend and warn the coachman; and then a few minutes sufficed to place the head of the great firm reclining back in one corner of the brougham, the doctor going before, to hold him in his place.

'But ought not a messenger to be sent on first, sir?' whispered Wynyan, leaning in.

'No: there is not time. He must be got home at once.'

Brant entered next, to sit down opposite to his uncle, and the doctor leaned forward.

'Tell him where to go, Wynyan, and to drive slowly.'

Wynyan looked him full in the eyes—a meaning, questioning look, and the doctor shook his head in reply.

Wynyan's thoughts flashed immediately to South Audley Street, seeing as if he were there the driving up of the doctor's brougham, and the horror and agony of one whom he would have died for to spare a pang. Then he was suddenly brought to himself.

'Let me take the chair, Mr Wynyan,' said a low-toned broken voice, and looking round, it was to see the old clerk, with the tears streaming down his wrinkled cleanly-shaved face.

'My poor dear old master and friend!' he kept on saying as they entered the great hall. 'My poor dear old master and friend.—Ah, Mr Wynyan, I have seen him for the last time.'

'No, no,' said Wynyan hoarsely; 'for Heaven's sake, don't say that!'

'I must, sir—the seal of death was on his face.'

The old man reeled and sank down in the chair, looking up piteously in his junior's eyes.

'Take my arm; I'll help you up into Mr Dalton's room. We'll send down for the chair.—Be good enough to take that chair up-stairs.'

This to one of the clerks in the lower room; and then, leaning heavily upon Wynyan's arm, old Hamber walked slowly up the two flights of stairs, and across the office into the principal's room, where he sank into a chair; but after drinking a glass of water, began to recover rapidly.

'Thank you, Mr Wynyan—thank you kindly, sir. A great shock: I did not know before that I was such a weak old man.'

'We must hope for the best, Hamber,' said Wynyan. 'Do you feel well enough now to be left?'

'Oh yes, sir; oh yes, I shall do now. You—your are going on—to Audley Street?'

'Yes, at once; I cannot stay in this suspense.'

'No: of course not. Pray, go. I can manage now;' and to prove it, the old man rose and walked out into the office, where he took his chair and leaned over the table to pick up a drawing-pen. 'There, sir, you see. I shall go on with my work.—Pray, go at once; and if you wouldn't mind, Gibbs will follow you, so that you could send me back a message in case you have to stay.'

'Of course.—Come with me, Gibbs,' said Wynyan; and taking a cab, he had himself driven to South Audley Street, where he stopped the driver about fifty yards from the house. 'Wait, Mr Gibbs,' he said; 'I will send back the news at once.'

The doctor's brougham was still at the door; but as Wynyan reached the steps, Dr Kilpatrick came out, looking haggard and old.

Wynyan's lips parted, but no words came, for he read the terrible truth in the faces of doctor and servant.

'Gone?' whispered Wynyan at last, as he stood grasping the doctor's hand.

'God help us! yes. I have lost a very dear old friend, Wynyan. Don't stop me. Doctors are not so hard-hearted as some people think. Here, come in my brougham; I'll talk to you there.'

Wynyan stood for a moment, as if dazed; then he shook his head.

'I have some one waiting—a messenger from the office,' he said in a voice almost inaudible from emotion.

'Send it, then. It was just as we reached the door.—Good-bye, Wynyan.—But stay,' he

said quickly, and he caught the young man by the arm. 'You had settled the business with him, and asked him that?'

'I had not seen him till I found him lying in the fit.'

'Good heavens!' said the doctor. 'And things like that! Too late, my lad—too late!'

The doctor hurried into his carriage; and as it was driven away, Wynyan felt giddy, and then started as if from some pang. For, as he passed the front of the house, there was a strange grating noise. One of the window blinds was being drawn down, and before he had quite passed, another followed.

'My darling!' he muttered. 'The agony and despair; and I dare not venture to your side, and tell you how my heart aches for you. God help her! What must she feel!'

'How is he, sir?' said a voice, for Wynyan was passing the young draughtsman who was waiting for the message.

Wynyan looked at him curiously, and then, in an almost inaudible voice: 'Gone.—Go and tell Mr Hamber; tell all, that our best friend is dead.'

He passed on, feeling stunned. He could think of nothing but the stern, brave, toil-worn face lying there in his own room rigid for ever; and beside it, upon her knees, the child he loved, the girl for whom he had worked, and whose happiness seemed to be his one aim. Wynyan's intimacy at the house had been slight, but enough for him to see the intense affection existing between father and daughter, and now this was ended by the sudden blow.

Wynyan wanted to be alone to think—to try and recover from the stunning effects of the shock—and he walked on aimlessly, fate guiding his steps till he entered the park, and went on across the grass till he was beneath the trees, and then on and on till he let himself sink upon a seat, close to the almost forsaken ride.

But even in the comparative calm of the place where the hoofs of the horses sounded deadened, his thoughts refused to flow. He could only sit there and think of a pale agony-wrung face, with the brow resting against the bed, at whose side *Rénée* must be crouching then, and a low moan escaped his lips.

He was conscious then of some one looking as he passed, and seeming about to turn to him and speak—to avoid which he hurriedly left the seat and walked on to the next, where he threw himself down to try once more and think whether there were anything that he could do to lighten *Rénée's* terrible load.

No: nothing. She could not even know how he loved her, and at such a time to write would be an insult. What was he but her father's trusted servant? He could not write: he could not speak. He must suffer as she suffered, for her pangs were his. Some day, perhaps, she would know, but everything was in the future.

All at once there was the dull sound of trampling horses, and a voice which was familiar spoke. He looked up sharply, and his breathing seemed to cease, for there, not ten yards away, cantering gently by, were *Rénée* and *Isabel Endoza*.

The latter saw him as he rose hurriedly, and said something to *Rénée*, who bowed also, but she was too far on to really see him. Then the grooms, one of whom was mounted upon a powerful chestnut horse, which he had enough work to hold in, went by and they were gone, the ladies evidently increasing their pace, while for a few moments Wynyan stood motionless, unable to think as to what he ought to do.

A terrible mist—a veil—had been drawn across his brain, and the more he fought against the feeling of confusion, the darker his mental powers grew. It was as if he were in some fevered dream, and he once more sank upon the seat, and rested his heavy head in his hands. Their damp coldness had the required effect, and at last he grasped the state of affairs.

Rénée, then, had been absent, riding with her friend, who must have sought her out as soon as she knew of the return from Brighton. And now, in utter ignorance of all that had taken place, happy, joyous, and free from all portent of the horrible stroke which had fallen, she was hurrying home to that awful, darkened house.

Even then, as Wynyan grasped the facts, he did not stir. He had started to his feet, but only to stand as if paralysed for a minute or so. Then, with a cry of agony, he started off, running, taking the shortest cut he could for the great gate, and reaching it at last, panting, to hurry nearly as rapidly through the intervening space.

'Shall I be in time? Shall I be in time?' he muttered hoarsely.

The answer came as he reached the corner of the street.

Dalton's groom was leading *Rénée's* graceful mare slowly away, and the house seemed to be staring at him blindly with its darkened panes.

TAKA KOJI:

A NEW SUBSTITUTE FOR YEAST.

THE idea of finding a substitute for yeast seems almost sacrilegious, for yeast has been used by the human race for untold ages; but, in the words of Horace, 'nothing is too hard for mortals to accomplish,' and now we have succeeded in making the gigantic forces of steam and electricity perform humble duties for us, we are turning to the opposite end of the scale, and taming the microscopical fungi to be our willing servants. Mr Jokichi Takamine, a Japanese chemist, is the latest successful worker in this field. Whilst studying under Professor Mills, F.R.S., at Glasgow University, the possibility of improving our methods of brewing and bread-making, by finding and cultivating other fungi more efficient than yeast, occurred to Mr Takamine, and when he returned to Japan he continued to elaborate his idea, in conjunction with Professor Atkinson of Tokyo University, until he arrived at a successful conclusion.

Our knowledge of fermentation and the part played by fungi in bringing about the chemical changes we describe by that name has, indeed,

been gained only within the last few years. At the beginning of the century, fermentation was such a simple matter of everyday life, that nobody troubled himself to inquire into it. Even later, it was thought by distinguished chemists, such as Liebig, to be a purely chemical phenomenon brought about by the oxidising action of the air, and to M. Pasteur belongs the honour of having discovered that fermentation was caused by the life processes of specific organisms. On the foundation supplied by this discovery, all our knowledge of fermentation and the science of bacteriology has been built up; and not only have we found out why alcohol is formed out of sugar, and why food goes bad in hot weather, but also why we suffer from epidemic diseases. Fungi differ from green plants in that they have no power of extracting carbon from the carbonic acid of the air, and all their nutriment is obtained from the more highly organised vegetable and animal matter on which they live. Ordinary fungi can only attack dead matter, the living organism being too powerful for them; but some fungi succeed in growing in the passages between the cells of the higher organisms.

Instances of this are the fungi that prey upon insects, such as the mildew that attacks flies in the autumn in our own country, and the curious plant that may be seen hanging from the large wasps in the West Indies. As a general rule, the minute class of fungi known as microbes or bacteria—and very few of these—are the only ones capable of attacking the blood and cells of the living animal.

Ordinary yeast, or barm as it is called in some parts of the country, is a fungus of the lowest order, and is closely related to bacteria. Under the microscope, a yeast cell appears as a yellowish egg-shaped body, full of small specks, and having generally one or two clear spaces filled with water. The cells are very small—about three thousand of them in a row would be an inch long—but not nearly so tiny as some of their cousins, the bacteria, of whom ten times as many would be required to make up the length of an inch. If one of these yeast cells is placed in a solution of sugar and kept moderately warm, it commences to grow. In this process it does not get appreciably bigger, but a small bulge in the wall of the cell appears, which soon enlarges to a bud, and, almost before it has attained to its full size, this bud begins to give off buds of its own; so that, in a short time, instead of one yeast cell, we have long strings of them growing through the liquid in every direction. To the naked eye, the solution appears turbid, and small bubbles keep rising to the surface, so that after a time a scum forms, and the whole mass is stirred up by the gas it is giving off. What is really happening all the time is that yeast is splitting up the sugar into alcohol and carbonic acid gas. Other things are formed at the same time in small quantity, including glycerine and the heavier alcohols that we call fusel oil, containing more atoms of carbon than ordinary alcohol. All the sugar is not converted into ordinary alcohol and carbonic acid, because the yeast, in growing, uses some of it to build up the new cells.

During the process of fermentation, the solution gets quite warm: the yeast cells give out heat in a similar way to human beings, only the heat of the latter is obtained by burning the carbon or charcoal of their food slowly in the oxygen they take in by their lungs, whilst the yeast cells keep themselves warm by means of the chemical heat given out when sugar is split up into alcohol and carbonic acid. In fact, from a mechanical point of view, the yeast cell and the human being are merely more or less complicated heat-engines. Curiously, cane-sugar or beet-sugar—the same substance chemically—is not fermentable directly by yeast, that is, the yeast cannot feed on ordinary sugar, so it has to convert it first of all into fruit-sugar, or grape-sugar. This is accomplished by means of another ferment present with the yeast. This substance is not alive like yeast, but is what scientific people call an 'unorganised ferment', resembling the similar substance manufactured by the glands of our own digestive systems. These unorganised ferments, whose action is not thoroughly understood, are purely chemical bodies that can sometimes be separated in actual crystals like salt or sugar. When they are introduced amongst materials subject to their action, they seem to work mechanically, so that the complicated chemical particles tumble over them, as it were, and get split up into simpler compounds.

In brewing beer, we have again to start with a substance that is unfermentable—barley. The first thing to be done is to convert it into something that will ferment, and here another unorganised ferment comes into play. This material is called diastase, and occurs naturally in the barley, and, in fact, in all seeds. It is the weapon used by the embryo plant to convert the stores of insoluble nourishment, principally starch, into soluble matter that it can use in growing. If the seeds are moistened and put in a warm place, they will begin to germinate, and the diastase will act on the starch and convert it into sugar. This is what happens in the process called malting; the seeds are allowed to grow until the diastase has changed most of the starch into sugar, and then the growth is stopped by subjecting the malt to dry heat, so that the tiny seedlings are withered and killed. The malt is now put into a huge tub, called a mash-tun, and treated with hot water, which extracts the sugar and everything else that will dissolve, and the liquor is then boiled with hops. The diastase will not stand heating beyond a certain point, and is killed in this process. The wort, as the liquor is called, is then cooled down to 60 degrees Fahrenheit, and run into the fermenting vats, where yeast acts upon it in the way we have described. When the yeast has used up all the sugar, it stops working. Just before this stage has been reached, the beer is run into barrels and allowed to stand, so that nearly the whole of the yeast works out through the bung-hole, and is caught in troughs placed for the purpose. Isinglass or finings are then introduced to filter off and carry down to the bottom any remaining cells of yeast, so that the liquor is bright and clear. English beer is allowed to ferment at a temperature of 70 degrees Fahrenheit,

but Continental beer is brewed on quite a different principle, the wort being cooled down to a much lower temperature, which is never allowed to rise appreciably. The consequence is that, instead of growing in long strings through the liquid, the German yeast grows on the sides and bottoms of the vats, and the fermentation takes much longer than in England. The substances produced also are rather different. It is not the alcohol in beer that makes people stupid and heavy, but a substance called furfurol, which is formed in small quantities at the high temperature at which English beer is fermented; Lager, Munich, and other Continental beers contain practically none of this injurious substance, and much larger quantities of them can be drunk with impunity.

Now we have described the main processes of brewing, we will return to the fungi that cause the fermentation and describe the new ferment of Mr Takamine. It has been known for many years that, besides the different kinds of yeast, certain moulds can convert sugar into alcohol, and can be made to work in the same manner as yeast. For instance, the brown mould known as *mucor*, that may be seen growing in long white threads covered with a brownish powder on different material, is one of these. *Mucor* is higher in the scale than yeast, for it multiplies in a somewhat similar manner to a flowering plant, instead of by the method of budding alone. When growing in the ordinary way, the long threads on the surface of the cultivating medium are seen under the microscope to be long branched tubes, divided at intervals by transverse septa, and filled with similar material to that found in the yeast cell. From these interlocking tubes, upright tubes are given off here and there, carrying brown masses of spores or seeds at the top; whilst other tubes descend like rootlets into the liquid or other material on which the fungus grows. Now, if the fungus, instead of being allowed to thrive on the surface of a liquid, is submerged, a remarkable change takes place in its mode of growth: the tubes break up into short lengths, which soon become rounded, and, if placed in a sugar solution, begin to bud in long strings. They break up the sugar into alcohol and carbonic acid, and behave in every way like true yeast, so that there is no distinguishing between them.

The problem Mr Takamine set himself was to find a fungus that would act in this way, but in a far more efficient manner than yeast, and, in addition to that, would render the wasteful and unsatisfactory process of malting unnecessary. He tried various kinds of fungi, including all ordinary ferments known both to the eastern and western worlds, including many kinds of bacteria, but without marked success, until he experimented with an obscure fungus known as *Eurotium oryzae*, belonging to the mildew family, which, on due cultivation, did all that was required of it. It was found that boiled bran was the best soil to grow the fungus in. The plant spreads on the flakes with great rapidity, and if highly cultivated by the aid of chemical fertilisers, it produces what correspond to flowers; but this is not the

best condition for obtaining the ferment, and when grown for commercial purposes, no fertilisers are used, and the fungus is cultivated at a lower temperature. In this latter state, the rootlets are covered with minute crystals of diastase, and the unripe seeds or spores are the active agents in producing fermentation. Thus we have the diastase ready to convert the starch into sugar without any malting, and, in brewing, the ground barley will only have to be mixed with a certain quantity of water and sufficiency of the new ferment, Taka Koji, as its inventor has christened it. Besides the saving of ground, space, time, and labour that will be effected by employing a ferment that is able to do its own malting, there will be a large saving of material, for the seedlings of the barley use up a part of the starch in their own growth before they are killed in the drying chamber of the malt-house.

Another property of the Taka Koji, although not important in brewing beer, will be immensely valuable to whisky distillers. Ordinary yeast cannot go on working after the alcohol in the solution reaches 12 to 14 per cent., but Taka Koji will work up to 20 per cent., so that distillers will be able to use much stronger worts than they do at present. It has the advantage, also, that it produces no fusel oil, and no furfural, the poisonous substance we spoke of just now. We may remark that, in making whisky, practically the same operations are gone through as in brewing beer, except that no hops are added. Afterwards, the fermented liquor is distilled, and as alcohol is more volatile than water, the distillate contains much more alcohol than the original liquor. The better-class whiskies are made in pot stills—that is, earthenware stills in which the whisky is distilled twice to bring it up to the proper strength. Cheaper whiskies and all other European spirits are manufactured in what are called 'patent' stills. The condensing worms of these stills are so arranged that the more volatile alcohol passes over to the receiver, whilst the greater part of the water is condensed and separated from the spirit, only one distillation being required. The pot-still whisky contains more fusel oil, and requires a longer time to mature than the other, but the resulting product is more palatable owing to the fusel oil breaking up into ethers, which improve the flavour of the spirit.

There is, however, a more important field for Taka Koji than brewing or distilling—namely, bread-making. Unless we are much mistaken, the new ferment will replace yeast entirely before long for this purpose. Taka Koji is such a vigorous ferment, and so certain in its action, that it will give much better results than yeast, for it will be able to hold its own against the lower organisms that cause bread to turn sour. These are often present with yeast, and cause the loss of many a good batch of bread and many a good brew of beer.

In connection with the new ferment, a few words about extract of malt may prove interesting. Malt extract is valuable to invalids, partly on account of the actual nourishment—sugar and nitrogenous matter—but principally

owing to the diastase contained in it. This diastase enables a person of weak digestion to assimilate bread, rice, and other starchy matters, for the diastase digests them for him. The best malt extracts are made by extracting malt with water not hot enough to kill the diastase, and then evaporating it down to a treacle-like consistency in vacuum pans at a low temperature. A good malt extract should digest many times its weight of cooked starch in a few hours, and there are several brands in the market that will do this; but many others are absolutely worthless. By a simple method of washing, the diastase can be dissolved out of the Taka Koji, leaving the yeast-like ferment behind. The diastase is thrown out of solution by alcohol, and it can then be compressed into tabloids, or any other suitable form, so that invalids can make sure of obtaining the digestive assistance they require in a pure form, without the possibility of being imposed upon by worthless extracts of malt.

The interesting point about the discovery to those who are watching the advance of science, is not the actual material victory that has been gained, but the hope of still greater progress in the same direction. This useful ferment is of precisely the same order as the bacterial ferment that turns our milk sour by converting the milk sugar into lactic acid, and is own brother to the mildew that ruins the hops, and another mildew that preys on the vines. The flavour and digestibility of cheese, for example, depend entirely on proper fermentation, and there is a magnificent opportunity here for finding a new ferment, or series of ferments, that can be depended upon. In the disposal of sewage and refuse, also, much might be done in securing proper fungi, which would at least destroy the germs of disease. Indeed, there seems to be no doubt that as much may be gained by studying and cultivating these lower forms of vegetation, as has been done in converting the wild vegetation of field and forest into the hundreds of useful plants that fill garden and orchard with blossom and fruit.

THE CAPTAIN MORATTI'S LAST AFFAIR.

CHAPTER III.—FELICITÀ.

SOME few days after his interview with Di Lippo, the Captain Guido Moratti rode his horse across the old Roman bridge which at that time spanned the Avella, and directed his way towards the castle of Pieve, whose outlines rose before him, cresting an eminence about a league from the bridge. The captain was travelling as a person of some quality, the better to carry out a plan he had formed for gaining admission to Pieve, and a lackey rode behind him holding his valise. He had hired horse and man in Florence, and the servant was an honest fellow enough, in complete ignorance of his master's character and profession. Both the captain and his man bore the appearance of long travel, and in truth they had journeyed with a free rein; and now that

a stormy night was setting in, they were not a little anxious to reach their point. The snow was falling in soft flakes, and the landscape was gray with the driving mist, through which the outlines of the castle loomed large and shadowy, more like a fantastic creation in cloud-land than the work of human hands. As the captain pulled down the lapels of his cap to ward off the drift which was coming straight in his face, the bright flare of a beacon fire shone from a tower of the castle, and the rays from it stretched on broad orange bands athwart the rolling mist, which threatened, together with the increasing darkness, to extinguish all the view that was left, and make the league to Pieve a road of suffering. With the flash of the fire a weird, sustained howl came to the travellers in an eerie cadence; and as the fearsome call died away, it was picked up by an answering cry from behind, then another and yet another. There could be no mistaking these signals; they meant pressing and immediate danger.

'Wolves!' shouted Moratti; and turning to his knave: 'Gallop, Tito!—else our bones will be picked clean by morning. Gallop!'

They struck their spurs into the horses; and the jaded animals, as if realising their peril, made a brave effort, and dashed off at their utmost speed. It was none too soon, for the wolves, hitherto following in silence, had given tongue at the sight of the fire; and as if knowing that the beacon meant safety for their prey, and that they were like to lose a dinner unless they hurried, laid themselves on the track of the flying horses with a hideous chorus of yells. They could not be seen for the mist; but they were not far behind. They were going at too great a pace to howl now; but an occasional angry 'yap' reached the riders, and reached the horses too, whose instinct told them what it meant; and they needed no further spurring to make them strain every muscle to put a distance between themselves and their pursuers. Moratti thoroughly grasped the situation. He had experienced a similar adventure in the Pennine Alps when carrying despatches for Paolo Orsini, with this difference, that then he had a fresh horse and could see where he was going; whereas now, although the distance to Pieve was short, and in ten minutes he might be safe and with a whole skin, yet a false step, a stumble, and nothing short of a miracle could prevent him becoming a living meal to the beasts behind.

He carried, slung by a strap over his shoulder, a light bugle, which he had often found useful before, but never so useful as now. Thrusting his hand under his cloak, he drew it out, and blew a long clear blast; and, to his joy, there came an answer through the storm from the castle. Rescue was near at hand, and faster and faster they flew; but as surely the wolves gained on them, and they could hear the snarling of the leaders as they jostled against and snapped at each other in their haste. Moratti looked over his shoulder. He could see close behind a dark crescent moving towards them with fearful rapidity.

He almost gave a groan. It was too horrible to die thus! And he dug his spurs again and again into the heaving flanks of his horse, with the vain hope of increasing its speed. They had now reached the ascent to Pieve. They could see the lights at the windows. In two hundred yards there was safety; when Moratti's horse staggered under him, and he had barely time to free his feet from the stirrups and lean well back in the saddle ere the animal came down with a plunge. Tito went by like a flash, as the captain picked himself up and faced the wolves, sword in hand. There was a steep bank on the side of the road. He made a dash to gain the summit of this; but had hardly reached half-way up when the foremost wolf was upon him, and had rolled down again with a yell, run through the heart. His fellows tore him to shreds, and in a moment began to worry at the struggling horse, whose fore-leg was broken. In a hand-turn the matter was ended, and the wretched beast was no longer visible, all that could be seen being a black swaying mass of bodies, as the pack hustled and fought over the dead animal.

Nevertheless, there were three or four of the wolves who devoted their attention to Moratti, and he met them with the courage of despair. But the odds were too many, and he began to feel that he could not hold out much longer. One huge monster, his shaggy coat icy with the sleet, had pulled him to his knees, and it was only a lucky thrust of the dagger he held in his left hand that saved him. He regained his feet only to be dragged down again, and to rise yet once more. He was bleeding and weak, wounded in many places, and the end could not be far off. It was not thus that he had hoped to die; and he was dying like a worried lynx.

The thought drove him to madness. He was of Siena, and somewhere in his veins, though he did not know it, ran the blood of the Senonian Gauls, and it came out now—he went Berserker, as the old northern pirates were wont to do. Sliding down the bank, he jumped full into the pack, striking at them in a dumb fury. He was hardly human himself now, and he plunged his sword again and again into the heaving mass around him, and felt no pain from the teeth of the wolves as they rent his flesh. A fierce mad joy came upon him. It was a glorious fight after all, and he was dying game. It was a glorious fight, and when he felt a grisly head at his throat, and the weight of his assailant brought him down once more, he flung aside his sword, and grappling his enemy with his hands, tore asunder the huge jaws, and flung the body from him with a yell. Almost at that very instant there was the sharp report of firearms, the rush of hurrying feet, and the blaze of torches. Moratti, half on his knees, was suddenly pulled to his feet by a strong hand, and supported by it he stood, dizzy and faint, bleeding almost everywhere, but safe. The wolves had fled in silence, vanishing like phantoms across the snow; and shot after shot was fired in their direction by the rescue party.

'Per Bacco!' said the man who was holding

Moratti up; 'but it was an affair between the skin and the flesh, signore—steady!' and his arm tightened round the captain. As he did this, a long defiant howl floated back to them through the night, and Guido Moratti knew no more. He seemed to have dropped suddenly into an endless night. He seemed to be flying through space, past countless millions of stars, which, bright themselves, were unable to illumine the abysmal darkness around, and then—there was nothing.

When Moratti came to himself again, he was lying in a bed, in a large room, dimly lighted by a shaded lamp, set on a tall Corinthian pillar of marble. After the first indistinct glance around him, he shut his eyes, and was lost in a dreamy stupor. In a little, he looked again, and saw that the chamber was luxuriously fitted, and that he was not alone, for, kneeling at a *prie-dieu*, under a large picture of a Madonna and Child, was the figure of a woman. Her face was from him; but ill as he was, Moratti saw that the fitting dress showed a youthful and perfect figure, and that her head was covered with an abundance of red gold hair. The man was still in the shadowland caused by utter weakness, and for a moment he thought that this was nothing but a vision of fancy; but he rallied half unconsciously, and looked again; and then, curiosity overcoming him, attempted to turn so as to obtain a better view, and was checked by a twinge of pain, which coming suddenly, brought an exclamation to his lips. In an instant the lady rose, and moving towards him, bent over the bed. As she did this, their eyes met, and the fierce though dulled gaze of the bravo saw before him a face of ideal innocence, of such saint-like purity, that it might have been a dream of Raffaele. She placed a cool hand on his hot forehead, and whispered softly: 'Be still—and drink this—you will sleep.' Turning to a side table, she lifted a silver goblet therefrom, and gave him to drink. The draught was cool and refreshing, and he gathered strength from it.

'Where am I?' he asked; and then, with a sudden courtesy, 'Madonna—pardon me—I thank you.'

'Hush!' she answered, lifting a small hand. 'You are in Pieve, and you have been very ill. But I must not talk—sleep now, signore.'

'I remember now,' he said dreamily—'the wolves; but it seems so long ago.'

She made no reply, but stepped softly out of the room, and was gone. Moratti would have called out after her; but a drowsiness came on him, and closing his eyes, he slept.

It takes a strong man some time to recover from wounds inflicted by a wild animal; and when a man has, like Guido Moratti, lived at both ends, it takes longer still, and it was weeks before the captain was out of danger. He never saw his fair visitor again. Her place was taken by a staid and middle-aged nurse, and he was visited two or three times daily by a solemn-looking physician. But although he did not see her whom he longed to see, there was a message both morning and evening from the Count of Pieve and his daughter, hoping the invalid was better—the former

regretting that his infirmities prevented his paying a personal visit, and the inquiries of the latter being always accompanied by a bouquet of winter flowers. But strange as it may seem, when he was under the influence of the opiate they gave him nightly, he was certain of the presence of the slight graceful figure of the lady of the *prie-dieu* as he called her to himself. He saw again the golden red hair and the sweet eyes, and felt again the touch of the cool hand. He began to think that this bright presence which lit his dreams was but a vision after all, and used to long for the night and the opiate.

At last one fine morning Tito appeared, and began to set out and brush the captain's apparel as if nothing had ever happened. Moratti watched him for a space, and then rising up against his pillows spoke: 'Tito!'

'Signore!'

'How is it that you have not been here before?'

'I was not allowed, Excellency, until to-day—your worship was too ill.'

'Then I am better.'

'Excellency.'

There was a silence of some minutes, and the captain spoke again: 'Tito!'

'Signore!'

'Have you seen the Count and his daughter?'

'Signore!'

'What are they like?'

'The Count old, and a cripple. Madonna Felicità, small, thin, red-haired like my wife Sancia.'

Moratti sank down again upon the bed, a satisfied smile upon his lips. So there was truth in his dreams. The vision of the night was a reality. He would see her soon, as soon as he could rise, and he was fast getting well, very fast. He had gone back many years in his illness. He had thoughts stirred within him that he had imagined dead long ago. He was the last man to day-dream, to build castles in the air; but as he lay idly watching Tito, who was evidently very busy cleaning something—for he was sitting on a low chair with his back towards the captain, and his elbow moving backwards and forwards rapidly—the bravo pictured himself Guido Moratti as he might have been, a man able to look all men in the face, making an honourable way for himself, and worthy the love of a good woman. The last thought brought before him a fair face and sweet eyes, and a dainty head crowned with red gold hair, and the strong man let his fancy run on with an uprising of infinite tenderness in his heart. He was lost in a cloudland of dreams.

'Signore!'

Tito's harsh voice had pulled down the castle in Spain, and Tito himself was standing at the bedside holding a bright and glittering dagger in his hand. But he had done more than upset his master's dreams. He had, all unwittingly, brought him back in a flash to the hideous reality, for, as a consequence of his long illness, of the weeks of fever and delirium, Moratti had clean forgotten the dreadful object of his coming to Pieve. It all came back to him with a blinding suddenness, and he closed his

eyes with a shudder of horror as Tito laid the poniard upon the bed, asking: 'Will the signore see if the blade is keen enough? A touch of the finger will suffice.'

NOVEL SHIPS.

THE attempt which M. Bazin is just now making to construct a steamship which shall roll over the water instead of being forced through it, will recall to mind many schemes of the past for revolutionising ocean navigation. Chimerical as the proposed vessel appears, the principle involved—that of propulsion by means of an immersed smooth cylinder—is not in itself an impossibility, for at least ten years ago an English admiral conducted some experiments upon this identical system. These experiments proved that if a smooth roller were driven at a very high speed, it would literally take hold of the water by friction as if it were a rope, but the losses caused by slipping were tremendous. No doubt, in smooth water a vessel could be propelled in this way and be stable; but one perched upon enormous cylinders would be a dangerous and disagreeable thing to be on board of in rough water.

Fads in shipbuilding seem to date from the seventeenth century, when a Dutch merchant gave orders for a vessel to be constructed for him like the pictorial representations of Noah's Ark. The shipping folk in the town where he resided jeered at him for his eccentric idea; but when the craft was completed, and she was found capable of carrying a third more cargo than other owners' ships, and no extra men were required to work her, the laugh changed sides. Probably this is the only instance on record of a 'fad' turning out successful when put to a practical test. In 1814, William Doncaster patented what he described as being 'the first hydrostatic ship which has ever appeared upon the habitable globe.' It consisted of five pontoons, sharp pointed, to divide the displaced water, so that she would rise well to the waves. Four water-wheels were fixed fore and aft, between pontoons one and two, and four and five, through which the water ran to propel the vessel. This invention, as might readily be imagined, proved to be of no use whatever.

What seems to have been the earliest attempt in using large drums as the means of propelling vessels was the invention of Mr Frederick Sang, of London, who in 1853 took out several patents covering various designs of this character. However, his drums were furnished with paddles, fixed either in the ordinary way, or movable on the principle of the feathering paddles. Many years later, some of the foregoing principles appeared in the 'Fryer Buoyant Propeller,' or three-wheel wagon. The wheels were hollow spheroids, holding the bed of the car or ship, above and entirely out of the reach of waves. These spheroids were not only the buoyant and supporting parts, but by their triangular position ensured stability, and provided the motive-power, rows of flanges on both sides of each wheel catching the water like a finely feathered oar. Each spheroid was capable of independent rotation, assuring handiness and

safety even without a rudder. Another inventor took the porpoise as a model for a ship, and endeavoured to show how she could be made to travel at the rate of one hundred miles an hour. The basis of the argument was, that the porpoise only used the equivalent to one horsepower to cut through the water at twenty-five miles an hour. Of the two-hulled *Castalia*, built in 1874; the *Bessemer*, with a swinging saloon, in 1875; and the *Calais-Douvres* of 1877, so much has already been written, that it seems needless to do more than mention them in this article.

Great things were expected to result from the introduction of the Aqua-aërial or wave-ship, but nothing has been heard of the invention for some years now. The vessel was designed with a view of doing away with the causes of sea-sickness, and to attain railway speed at sea, combined with safety and steadiness. She was a broad flat-bottomed structure with a semicircular bow, and had three keels, screw propellers, and a steam-engine. Except at the stern, the vessel did not rest upon the water, but upon a layer of air, introduced by means of funnels installed upon the deck. The three keels, besides diminishing the rolling, retained between them the air introduced below the hull, and prevented it from escaping at the sides. As the speed of the vessel developed, so the shallow draught, it was stated, decreased. The propellers were entirely submerged. Instead of ploughing its way through the water, the ship was to skim along or over the surface, in order to avoid wave-making, and thus get rid of the resistance of a large body of water. By means of this invention, the journey to New York and back was to be effected in six days.

The *Ocean Palace* steamship was patented by Mr Robert Wilcox, of Melbourne, Australia, the claims for which ranked themselves under the heads of speed, safety, and comfort. Double hulls were used, but each of them was divided into two cigar-shaped portions, thus giving to the submerged whole a quadruplicate character. The design was intended to give the least resistance, with the greatest buoyancy and stability. A couple of drums were placed fore and aft between the hulls, which were to be driven by the engines as if they were paddle-wheels. Over these drums was placed a continuous band of iron links, upon which paddles were fixed. It was claimed that this vessel would be able to run from Melbourne to London in twenty-six days.

In 1883 Captain William Coppin, who built the first large screw steamer which crossed the ocean, designed a new style of vessel, models of which were exhibited at Boston, U.S.A. It was a compound ship, composed of three hulls fastened together, the whole being decked over. The outer hulls were of narrow beam and of equal length; and a much shorter hull was placed in the centre space between the two longer vessels. The three hulls were rigidly connected by iron or steel bulkheads, box-girders, and steel decks or frames, in such a way as to form complete platforms or decks, so as to leave considerable extra spaces between the ships. The centre ship carried the engines,

and was provided with a propeller at each end. All three hulls tapered from the centre, both vertically and longitudinally, and came to a rounded point at both ends, so as to enter the wave and reduce the pitching motion to a minimum, the rolling motion being done away with by the extent of water-spaces between the ships. The platforms or decks extended about three-fifths of the whole length of the outside ships in the centre, and the remaining portions of the ends, forward and aft, were covered over for passing through the waves, but the space between was not decked over. Stability, safety, and speed were claimed for vessels so constructed, and the design was stated to have been approved by eminent naval men.

Two years later, M. Emil Adam, of Prague, Austria, designed a strange-looking craft, with which astonishing results were obtained. The inventor set out to reduce the resistance of the water as much as possible, and for this purpose constructed the hull of his vessel of two hollow cylinders, which were tapered from the middle toward both ends, whereby a ship resembling in shape a cigar was obtained. Each cylinder was provided on its outer surface with a screw thread, formed of metal plates riveted on the cylinder, the line of inclination of the thread being about forty-five degrees to the longitudinal axis of the cylinder. Annular recesses or breaks were formed in the cylinders, at suitable intervals, for the bearings supporting the frame of the vessel. The cylinders were rotated by a suitable engine, on the deck or platform of the vessel. The water in which the cylinders revolved acted as a nut for the screw threads, enabling a rapid motion to be obtained in either direction, especially as the frame, decks, &c., were entirely above the surface of the water, and thus offered little or no resistance.

Probably the only vessel of its kind in the world was built at Christianstail, in Sweden, in 1890. It could be propelled on land by means of its own engines, and was intended for the traffic on two lakes close to Boras, which were separated by a strip of land. Rails were laid between the two lakes, and the steamer was to run itself across from one lake to the other. When tried at the works, the vessel fulfilled the tests very well. The engine was of ten horse-power, and the boat could accommodate some sixty passengers. Another original craft was the steamship *Louvre*, built at Nantes, in France, about three years ago. She was the first ocean vessel provided with two central propellers, which were placed underneath the middle of the hull instead of at the stern. It was claimed that by this means a steamer could remain at sea during the most terrific weather without any danger being incurred. The *Louvre* ran regularly between Paris and Nantes, calling at Brest. Quite recently, a patent was granted in London for a ship the propulsion of which was to be ensured under all circumstances, being fitted with both screw propellers and paddle-wheels, driven by independent engines, while another one was secured for steamers convertible into traction-engines!

Mr Edison is now reported to be at work with a plan to grease the sides of ships, so that they will slip through the water more

readily. He says that the friction of salt water and its constituents is much more than is generally believed; and if he can only do what he thinks possible, the *Campania* will be enabled to travel from Liverpool to New York in four days. Curiously enough, several inventors have designed steamships which were stated to be capable of performing this voyage in four, four and a half, and five days; but it is a matter of doubt whether the rapid runs already made by vessels of the ordinary type will ever be reduced to any appreciable extent, due regard being paid to safety during all weathers.

Want of space alone prevents details being given of Mr Jolly's *Ark Saloon*; Mr Gadd's 'loose sections'; Captain Blevens's 'dome ship'; Mr Davison's ship; Mississippi Company's vessels with double hulls and drop keels; Mr Shone's non-sinkable ship; Mr Graham's steamer with nine hulls; Signor Brin's ship; Mr Fryer's *Arrow* type; Mr Hodgett's patent ship; Mr Lincoln's 'tapering' hull, and several others, all of which possess peculiarities of more or less utility.

W. B. L.

GENTLEMAN JERRY:

OR, HOW THE KRAAL WAS SAVED.

It was a dull and cheerless day. The rain was sputtering down viciously upon the greasy pavements and filling the gutters, in each of which ran a drummy rivulet, swift and froth-topped. The few passers-by looked damp and miserable as they hurried on their way, and took no notice of the tall, spare figure muffled in a military greatcoat who was marching up and down the pavement at the regulation pace. The knot of coloured ribbons falling soaked and limp from his forage cap proclaimed him to be a recruiting sergeant; but there seemed nothing for him to recruit beyond a half-starved, wholly bedraggled mongrel, which was carrying on investigations round an empty ash bucket. Old Sergeant Dreadnought had been deserted by his companions, who had sought refuge in a neighbouring public, where many a Queen's shilling had been converted, like many an ordinary one, into the glass that both cheers and inebriates. The sergeant was used to being deserted, however, for he was an observant man, and had often noticed that his largest hauls—and he was famed for large hauls—had been made on wet and dismal days, and he made a point of being at his post in all kinds of weather.

For once, however, the sergeant seemed to be wrong. It was growing dusk, and not a single aspirant for military glory had he interviewed that live-long damp and dirty day. He had even made up his mind to desert the cold pavement and cheer his inner man by a glass of grog, when, as he turned to put his resolution into effect, he saw something which caused him to stop short and resume his measured tramp. This something was the figure of a man who had appeared at a corner on the opposite side of the street; and the well-practised eye of old Dreadnought had recognised

in him a likely prey. The man was young, tall, and broad, but evidently much thinner than he once had been, or else his clothes—and sorry clothes they were—would not have hung so loosely on his great frame. They were soaked with rain, and the man shivered as a gust of east wind caught him at the corner and nipped and buffeted him, seemingly in wild delight at having at length found a being in this quarter who was susceptible to its attack, for it had done its best all day with the gaunt, gray-coated individual on the other side of the street, but apparently without the least effect.

The man glanced across the road, and evidently caught sight of the sergeant and his ribbons, for he hesitated a moment, then, as the old soldier watched him out of a corner of his eye, he produced from somewhere in his ragged trousers a halfpenny, and that only after a careful search. Balancing it on his thumb-nail, he tossed it upwards and let it fall on the pavement; then picking it up, he began rapidly to cross the road.

The sergeant, who had been an interested spectator of this performance, straightened himself, or rather went through the motions to produce such a result, for he was already as straight as it is possible for a man with an ordinary built spine to be, cleared his throat, and put an extra twist on his moustache, then turned to meet the stranger.

Old Dreadnought had in his time enlisted many a queer customer, but, as he said afterwards, 'Never in all my life 'ad I seed sich a sad look on a man's face. He seemed as if he 'ad swallowed his grog without a-tasting of it.'

The young man came straight up to the sergeant, and without any preliminary, quietly said: 'I wish to enlist, if you please.'

'You do, my lad; then come along wi' me.'

They adjourned to the public, and many were the remarks the old sergeant had passed upon him by his fellow-recruiters for stealing a march upon them; but he was well used to their banter, and proceeded to administer to himself and to his latest capture a stiff glass of whisky and water. The new recruit turned out to be a very silent fellow, for he answered all questions as shortly as possible, and seemed disinclined for company. He gave his name as Jeremy Tobin; his age as four-and-twenty, but he looked nearer thirty; beyond that, there was little information to be got out of him; and he was finally left to himself, as 'a surly sort of cuss,' though the men pitied him, his face was so careworn and sad.

The 'surly cuss' was placed in the company of recruits which I had the honour and misfortune to lick into shape, and a sorry lot they were.

Jeremy Tobin was by a long way the best of them both as regarded physique and intelligence; and partly on this account, and partly because of his strange, settled melancholy, I took an interest in him and watched him closely. He was a fine-looking man when shaved and decently dressed; and under the combined influence of warm clothes and good food, he showed up as a very powerfully built fellow, well over six feet, and with the chest

and limbs of a Hercules. But though he thus improved as regarded his outer man, his demeanour never altered. I had seen many a gloomy and miserable recruit, but they always cheered up or deserted in the course of a month or two; not so Gentleman Jerry, as he had been dubbed.

Polite at all times, and eager for his work, he seldom spoke unless spoken to, and was never known to smile. Indeed, 'as glum as Gentleman Jerry' came to be quite a proverb in the regiment; and though at first his comrades rallied him on the subject, they soon wearied of it, and he was allowed to 'gang his ain gait.' I did my best to win his confidence; but beyond a 'Thank you, sir, you are very kind,' he would tell me nothing, even when I once came upon him with a letter in his hands, sobbing like a child, and begged him to let me help him.

Once only, to my certain knowledge, did Jeremy Tobin rouse himself, and then it was a rousing with a vengeance. We were in camp at the time, and Jeremy, while taking a solitary stroll, had come upon a great, coarse brute of a fellow unmercifully flogging a little drummer boy belonging to our regimental band. This man, who was a corporal in another regiment, had the reputation of being a terrible bully, and was without doubt one of the strongest men in Her Majesty's service. He was inflicting chastisement on the little drummer for daring to assert that 'our regiment could lick his hollow at any mortal thing.' Gentleman Jerry had taken the surprised bully by the collar, and dragged him off the boy by main force; then loosing his hold of him, he had calmly requested the boy to tell his version of the affair. The little chap blubbered out his story, and then Jeremy had politely asked the bully to give him his version. Finding he had none to give, Gentleman Jerry had straightway stripped off his coat and gone for him on the spot, saying never a word, but pounding the man in a terribly cool and scientific, not to say effective fashion; after which he had donned his coat and strolled away as if nothing had happened, but gaining for himself the respect and admiration of his comrades, while the boy he had rescued worshipped him from afar.

If, however, we had hopes that this little incident might brighten up Jeremy Tobin, we were doomed to be disappointed, for he fell back into his old ways again, sober, moody, and glum, and so he continued till affairs in South Africa summoned us to Portsmouth, and thence to the Cape.

Day was breaking over the veldt, but early though it was, the outpost was up and stirring. It was no time to lie abed when the main column was miles away across the river, and bands of Zulus were scouring the country, 'seeking whom they might devour;' and if one happened to be located as we were in an old kraal on the slope of a low hill rising steep and grass-covered from the plain, defended merely by a double row of palisades, a couple of field-pieces, and a score or so of infantry of the line, there was all the greater need for

incessant care and watchfulness, if we ever hoped to see the shores of 'Merry England' once again.

Why there was any need for such a place to be defended at all, was a fact which might have puzzled wiser heads than ours; but there were many things in the course of that fatal war which never were and never will be explained, and thus it was that we officers stretched ourselves, and yawned, and blinked, and finally rose for our morning cup of coffee and round of daily labour, which consisted for the most part of scrutinising the surrounding plain and hills through our field-glasses, eating, drinking, and sleeping with what good-will we might.

For a whole week we had been cooped up, getting no news save what our two Kaffir scouts brought in, and that did not amount to much, and we wearied with an exceeding weariness of the monotony of outpost duty. Little did we think that the end of it, and to not a few of us the end of all things, was rapidly approaching, for Cherry-beak, one of our scouts, a little fuzzy-haired mortal with a fiery red nose—hence his high-sounding name—had come in the previous night with news that all was quiet and the country apparently deserted. It was true that his companion, Knobby—short for Knob-nose—had not yet returned; but there was nothing peculiar in this, and we were somewhat surprised when our orderly informed us that our worthy scout had been sighted making for the kraal at a pace which he did not usually affect. We brisked up at this, and eagerly awaited his arrival, discussing in the meantime what this piece of information might portend.

'The beggar is hungry, depend upon it,' drawled Jones, our young sub.; 'never knew such a man as Knobby for his breakfast—that's the meaning of his quick travelling, I'll bet.'

'Jones, man,' said our captain, a worthy Scot with a fund of dry humour, 'ye must not be always judging folk by yourself; but, speaking seriously, I fear this means something more than breakfast to Knobby; and the worst of it is, in the event of an attack, we have not any great store of ammunition, thanks to Tobin; still, it may merely be a scare, and whatever you do, don't let the men hear about the cartridges.—But here is Knobby and the news!'

Knobby was a Swazi by birth, a tall, well-built man, a good scout, and a splendid runner, but it was evident, from his distressed breathing, that he had had about enough of it on the present occasion. He saluted, and was about to make his report, when Captain Forbes beckoned him to follow, and accompanied by myself as senior lieutenant, made his way into the hut which served as the officers' quarters. Then Knobby told his tale.

Some ten miles to the north, he had come upon a small 'impi' encamped, evidently a detachment from a larger body, and had learned that they were on the way to our kraal, though, apparently, they were unaware that we were in possession. He had managed to steal away unperceived, and had run at full speed back to the outpost to give us timely warning.

'How many might there be?' Knobby had

counted them. There were three hundred young warriors, and they would be here in a few hours at the most, for their halt had merely been a temporary one.

It was a pleasant prospect! Here were we, not much over forty men all told, with a decidedly small stock of ammunition, waiting in an old kraal far away from the British lines for an attack from three hundred fighting men of one of Cetewayo's most famous regiments, led by a young but ambitious and clever warrior; for Knobby had, thanks to the long grass, got close enough to learn details. Well, there was nothing for it but to make the best of it, though we took care to send Cherry-beak off with a message to the column. It was not the numbers we cared so much about, for we were behind stockades; it was the cartridges.

'Confound that mad fellow!' muttered the captain as we left the hut. 'What possessed him to meddle with the ammunition? But for that, we might have laughed at them.'

'If his madness has added to his strength, he may be of use yet,' I answered, 'especially if it comes to close quarters.'

'Use! look at him; what use do you think can be made of that man?'

In a corner of the little enclosure sat a strange-looking figure, a huge, heavily-built man, his head sunk forward on his chest. He was busily engaged in making a mud-pie, as engrossed in this occupation as if he had been a child of six instead of a great stalwart soldier.

Zululand had not dealt kindly with Gentleman Jerry.

On the march up country he had been struck down with sunstroke, and though he rapidly recovered at the time, he had afterwards seemed more gloomy and silent than ever. Then, a couple of days before we left the main column, a letter arrived which had greatly distressed him. Still he was well enough, and seemed glad when he was allowed to accompany the detachment; but none of us had been much surprised when, two days after we had reached the kraal, Gentleman Jerry was found laughing and gibbering to himself as he sat bareheaded in the sun. It was a more serious matter, however, when we found that he had gained an entrance to the hut in which our precious stock of ball cartridge was stored, and had destroyed as much as he could lay hands on, tearing open the cases and using the powder for his own ends—namely, mixing it with water and making fizzing cones of it.

A strict guard had been placed over him since then, and now he was occupying his time making mud-pies and trying in vain to make them fizz also. It was a pitiable sight; but we had other things to think of, and soon all the men save Jerry and his guard were at their posts; ammunition was served out, and a large supply of water brought in from the spring close by the kraal. Then we waited for the enemy.

We had not long to wait; but it seemed hours and hours before any sign of them appeared; then all of a sudden the crest of a low hill to the north of us was black—black with armed Zulus. Three hundred of them! there must have been nearer three thousand, a long

line, which, pausing a moment, began slowly to creep down the yellowish-gray hillside like a great black and white snake. They were a couple of miles away; but we could see them clearly through the glasses, and to the unaided eye the glint of the morning sun on their assegai blades looked like burnished silver. I looked around me. The men were at the loopholes which had been cut in the outer stockade. With grim and set faces they were watching the advancing foe, and for the most part were quiet and silent.

We officers were gathered on the rising ground in the middle of the kraal, for there was no need of concealment; and by one of the huts was the huge form of Gentleman Jerry working away at his little heap of mud, and over all floated the old flag, its folds streaming out against the gentle breeze.

Away out on the plain the impi had halted, and with our glasses we could see the headmen consulting together. Then on it came again without cry or sound, and again halted out of range. We waited anxiously for its further movements, and then, to our surprise—for the Zulus usually attack in great force—a small party moved to the front, while the rest squatted down and prepared to watch the assault. It was evident they deemed our numbers small, but they could have had no idea we had the field-pieces, or they would have attacked us with a far larger force than the three hundred unringed warriors who stood in a double line being inspected by their chiefs. We learned afterwards that the three hundred young warriors, constituting the party Knobby had come across, had begged as an especial favour to be allowed the privilege of eating up the white men. Whether they altogether enjoyed the eating-up process we must leave the reader himself to judge. Fortunately they could only attack us by the face of the slope, owing to the nature of the ground, and our whole available force was grouped together at this part of the kraal to await the Zulu charge. Next moment the line was in motion, and up the slope they came, slowly, but steadily, their great war-shields in front of them, and we could see that some of them carried rifles. Then they burst into a wild war-song, the burden of which came rolling up the hill towards us. 'Slay, slay,' they chanted; 'the sun is red; we shall eat them up; the white men shall die; onward, children of the Amazulu; kill, kill!' But the kraal was silent. And now they quickened their pace, and swept upwards, their plumes waving, and their fierce faces grinning at us above their shield-points; but the kraal was no longer silent, for suddenly the field-pieces opened fire upon them with deadly effect.

Taken altogether by surprise, they halted a moment, and seemed to waver, then, encouraged by their leaders, they poured in a scattered volley, and throwing away their muskets, drew together for a final charge; but quick and sharp came the command, and a blaze of fire sprang from the stockade, as the Martinis poured in a deadly hail upon their ranks. The battle-fever was upon them, however, and undeterred, up they came, eager to grapple with the hidden foe; but it was not to be.

Fierce and terrible as they were, more fierce and terrible was the rain of shot which met them, and down they went, dozens at a time, writhing and bleeding, biting at the long grass and clutching it in their death-agonies. Still, so wild and furious was their charge, that they were not twenty yards from the kraal when what was left of them turned to flee; but, as they fled, a great mocking cry rose from the plain, so that some turned back, and met a warrior's death on the blood-stained slope.

'Cease firing!' We could not afford to waste a shot upon the fugitives, and yet we had repulsed the first attack with but one man killed and four slightly wounded, two of them by assegais. But down in the plain they had gathered again for the fight, and the roll of the war-chant from two thousand savage throats rose upon the morning air. On they came, pouring in two volleys, and rushing to the charge, heedless of the bullets which tore through them. How could we hope to stem such a living torrent? In front ran a tall warrior, waving a heavy knobkerrie above his head and cheering on his followers. He seemed to bear a charmed life, for not a bullet reached him.

'A guinea to the man who pots the big nigger,' shouted Jones. Poor lad, they were his last words, for an assegai caught him full in the throat; but, as he fell, a heavy revolver bullet bowled over the 'big nigger,' and he was trampled under foot by his followers as they bounded onwards.

'Back, back!' came the cry; and the red-coats retreated quickly behind the second row of stakes, followed by a flight of spears. As I ran with the rest, I felt a sudden hot pain dart through my leg, and next moment was lying between the palisades, pinned through the calf by an assegai. There I lay with some others who had fallen, waiting for death, for the death that was coming swiftly up the slope. I was strangely cool, save for the pain in my leg, which made me wince whenever I tried to turn, and all the while the bullets sang above my head as they went sweeping down the hill through and over the outer palisades. Suddenly I saw the outer barrier shake and splinter some twenty yards away, and next moment it was down, and a great Zulu rushed through the opening in it, and paying no heed to me, ran straight at the inner row of stakes. With a bound he was upon them; but as he hung there, I heard a strange low laugh come from the kraal, and then, above his black head, the butt of a rifle came into view. Next moment, it descended; and the warrior, his head split like a pumpkin, fell backwards, just as three other Zulus came rushing through the gap. But a roar which rose high above the din of battle came from the kraal, and right through the inner barrier Gentleman Jerry burst his way, a clubbed rifle clenched in his great hands. He made straight for the three Zulus, and first one and then another went down with their skulls battered out of all shape, while the third, a little squat man, drew back in terror. The madman was bleeding now from a couple of assegai wounds; but I saw his eyes gleam with fury as the terrified warrior was jerked

aside as if he had been a child, and in his place there stood a gigantic Zulu whirling a heavy knobkerrie in the air. It needed not his plumed head and magnificent leopard-skin kaross to proclaim him a chief; it was evident from his lofty bearing and every movement of his lithe but giant frame. A crowd of Zulus were now at the gap in the stockade; but they stood there in awe, gazing at their chief and the strange white warrior.

From the kraal came the hoarse order, 'Keep on firing, lads,' and the bullets still whistled and sang above me; but the fire had slackened, for the cartridges were all but spent.

Crash! Knobkerrie and rifle-butt had met, but away spun the former, while the Martini was jerked out of the madman's grasp. With a cry of triumph the chief sprang forward and plunged his stabbing assegai into Jeremy's right side. Next moment, the madman had plucked it out, and the next he had the Zulu in his terrible embrace. To and fro the tall figures rocked, and then, as I lay, I could see the chief's eyes start from their sockets and his face grow wild with fear and pain. Then there came a cracking, grinding sound, horrible to hear, and Gentleman Jerry tossed the Zulu's crushed and mangled corpse from him, and with a great effort stood erect, the blood pouring from his mouth; then, with a cry, he threw up his arms and fell beside his prostrate foe.

But even as he fell, and as friendly arms dragged me into the kraal, from the plain below a bugle call rang out, and a hearty British cheer, followed by a rattle of carbines, brought joy to us, and carried dismay to our baffled foes, who, as they fled, were cut down in dozens by the cavalry who had come so timeously to our rescue.

When all was over and the kraal was cleared, Gentleman Jerry was found lying quiet and still, a strange smile on his blood-stained face, from which the madness had gone for ever. So we buried him there with his comrades, by the old kraal on the grassy slope, and there he lies in that far-off land, and his secret lies buried with him.

Strangely enough, about a year afterwards I was looking over the 'agony' column of the *Times* when I came upon the following: 'J. T. (S—e). My poor boy, it has all been a sad mistake, and a vile plot; the letters were frauds. Come back, for God's sake, before it is too late.'

Jeremy, or not Jeremy? that is the question.

OREGON WOOD-RATS.

A CORRESPONDENT from Falls City, Oregon, writes: The Oregon wood-rat has a curious fondness for bright colours. It is larger than the common rat, with a long bushy tail; and it makes its nest at the top of fir-trees—a mass of sticks and moss. But as soon as any one builds a hut in the forest, the wood-rats come to inspect it, as they are very curious, and also very fond of appropriating any bright objects, and will carry away forks, spoons, &c. They often desert the trees and begin to build a nest under the roof of the hut, or in any undisturbed place. I once found a nest half-made in an old wash-tub, and lined with red flannel. When we

arrived here thirteen years ago from England, it was nearly evening; the roads had been very rough from Corvallis, and we were quite tired out, and very glad to see the old hut on the claim we had bought. No one felt inclined to do much that night, so we spread mattresses on the floor and prepared to have a good night's rest. But no sooner was the light extinguished than there came a hurry-scurry of little feet, and bright eyes shone all round us, much to our alarm; but they all vanished as soon as the candle was lighted, some taking flight up the wide open chimney, others up some stairs into a loft.

The man who came with us said: 'Oh, those are wood-rats. They will carry to their nests any little articles you may leave about.'

The next day we obtained traps, and tried to catch them in the same manner as English rats with toasted cheese or a piece of bacon; but they took no notice of either of these delicacies. We noticed that several times, when I left a bright red crochet shawl I had lying on a chair at night, pieces were torn off it, and once it was dragged up the steps to the loft; so we threw it over a trap, and the next morning a large wood-rat measuring sixteen inches from head to tip of tail was caught; and that was the first of ten that were attracted by the same shawl, which never failed to catch one whenever the trap was covered with it.

We very rarely see one now. I suppose they have retired farther back into the forest, away from civilisation. In one of their nests here I saw a pocket-knife, a steel fork, a collar-stud, and pieces of a red flannel shirt. They live upon berries, nuts, and various roots, and seeds of the fir-cones; but do not care for maize, oats, wheat, or potatoes, &c., like squirrels and chipmunks.

IF THOU WERT FALSE.

If thou wert false to me, what could I do?—
If thou wert false to me, what could I say?
Could I look up and face the light of day—
Thou faithless and I true?

I could not dare to speak a word of blame,
But in my heart the grief would lie and ache;
Calmness without, my lips could never take
The music of thy name.

The pain would choke me if I tried to weep—
The stifled sorrow would lay waste within;
Tears might relieve, but tears I might not win—
Rest, but I could not sleep.

There could be neither tears, nor speech, nor rest,
Till I forgave as I would be forgiven;
Then might the bonds of frozen grief be riven,
And sobbings ease my breast.

If thou wert false to me while I was true,
I would remember rather than forgive—
Loving thee still with that uncanceled debt
Of love for ever due.

ARTHUR L. SALMON.

Printed and Published by W. & R. CHAMBERS, Limited,
47 Paternoster Row, LONDON; and EDINBURGH.